BCN Buchanan Land System

Rises and low hills between the Tothill Range and Julia Creek, extending from the River Light to Ngapala

Area: 110.6 km^2

Annual rainfall: 450 – 560 mm average

Geology: The western side and most of the southern part of the Land System is underlain by tillites and fine sandstones of the Appila Formation. Siltstones, shales and phyllites of the Tapley Hill Formation underlie the eastern side. There are low ridges of Gilbert Range Quartzite (southerly extension of the Tothill Range) on the south western edge, and low ridges of quartzitic sandstone (Eudunda Arkose) in the north. There are limited areas of alluvial sediments derived from localized reworking. These are mainly clayey, but adjacent to the Tothill Range they are coarser grained and stony. About 75% of the rocks and sediments are mantled by soft aeolian carbonates.

Topography: The Buchanan Land System is a north - south trending belt of undulating to rolling rises and low hills forming the western side of the Julia Creek valley. Slopes are mostly in the range 5-20%, but with some gently inclined outwash fans, and occasional steeper rocky ridges. The landscape has a pronounced north - south grain corresponding to the strike of the underlying rocks. Water courses draining eastwards towards Julia Creek cut across this grain. From about Buchanan south, the landscape is more irregular, possibly due to distortion of the underlying rock strata. Moderately steep low rocky hills (eg Waterloo Hill) separated by undulating rises characterize this area. On the eastern side, water courses drain into Julia Creek, but on the west, drainage is directly into the River Light which has cut a gorge through the Land System midway between Anlaby and Bagot Well.

Elevation: 620 m on the northern watershed to 330 m on the River Light

Relief: Maximum relief is 70 m

Soils: Hard red loamy soils with clayey (often dispersive) subsoils are characteristic of the land.

Main soils

Soils formed over basement rock

D7b Hard stony sandy loam over poorly structured red clay
D1 Hard loam over red clay
1 Shallow stony sandy loam

Minor soils

Soils formed over alluvium

D3a Hard loam over dispersive red clay
F2 Stony sandy loam over dispersive clay
D2 Loam over red clay
D3b Hard silty loam over red or brown clay
A6 Calcareous clay loam

Soils formed over basement rock

D7a Hard loam over poorly structured red clay
A2 Shallow calcareous loam

Main features: The Buchanan Land System comprises a mix of moderately steep and rocky non arable to semi arable ridges and low hills, and more or less fully arable undulating rises, fans and creek flats. The arable land is characterized by sandy loam to clay loam surfaced texture contrast soils with moderate natural fertility, but often shallow and stony, and generally with poor surface soil structure. The soils on the eastern side of the System are generally more clayey and more fertile and have better physical properties than the predominantly sandier soils in the west. Erosion potential is moderate to high throughout due to the combination of moderate slopes and high soil erodibility. Soil acidification is becoming more of a problem, particularly on the deeper more productive soils. Saline seepages occur sporadically. Soil salt levels, as well as pH, should be regularly monitored.

Soil Landscape Unit summary: 17 Soil Landscape Units (SLUs) mapped in the Buchanan Land System:

SLU	% of area	Main features #
AAC	0.4	Dissection slopes of 20-40%, where a water course has cut down through basement rock. Main soil: shallow stony sandy loam - **L1** (D). This small area is too steep and stony for any uses other than grazing.
ALC	5.0	Moderately steep rocky low hills formed on tillites. Slopes are 15-40%, and relief is up to 70 m. There is 10-20% rock outcrop and 20% or more surface stone. Main soils: shallow stony sandy loam - **L1** (E) and hard sandy loam over poorly structured red clay on rock - **D7b** (E). This land is moderately steep and rocky with shallow soils. Where tree cover remains, it provides useful stock shelter.
AQB	4.1	Quartzite ridges, 20-40 m high with slopes of up to 25%, up to 20% outcropping rock and 20% or more surface quartzite. Main soils: shallow stony sandy loam - **L1** (E) and hard sandy loam over poorly structured red clay on rock - **D7b** (E). These ridges are too stony, and generally too steep, for any uses other than grazing.
DBB DBC	1.8 22.0	Rises formed on fine grained Tapley Hill Formation rocks. There is up to 5% outcropping rock in linear reefs. **DBB** Very low rises with slopes of 2-4% **DBC** Undulating rises to 30 m high with slopes of 4-12%. Main soils: hard loam over red clay on rock - **D1** (E), with shallow stony sandy loam - **L1** (L), hard sandy loam over poorly structured red clay on rock - **D7b** (L), hard loam over poorly structured red clay on rock - **D7a** (L), hard loam over dispersive red clay - **D3a** (M) and shallow calcareous loam - **A2** (M). The soils are moderately fertile but are often shallow, reducing their capacity to store moisture. Surface soils usually set hard, causing increased runoff and erosion hazard, and affecting workability and emergence/early plant growth. Most of the land is arable and should be productive in seasons with extended spring rainfall to overcome soil moisture shortages.
DHC DHD	26.9 5.2	Rises formed on medium to coarse grained rocks of the Appila Formation. Up to 20% of the surface is covered by rocky reefs and stone. **DHC** Rises to 40 m high with slopes of 3-12%, and 95% arable. **DHD** Rises 40 m high with slopes of 10-20%, and about 75% arable. Main soils: hard sandy loam over poorly structured red clay on rock - **D7b** (E) and hard loam over red clay on rock - **D1**(C), with shallow stony sandy loam - **L1** (L) and hard loam over poorly structured red clay on rock - **D7a** (L). This land is mainly arable, with rocky outcrop and moderate slopes reducing cropping opportunities in DHD. The main soils are poorly structured, only moderately fertile and often shallow, further reducing productive potential. Excessive runoff, waterlogging on lower slopes, workability difficulties and patchy early crop growth are consequences of poor soil structure. The soils are highly erodible, so even moderate slopes are at risk of erosion.
DSC DSD	3.4 11.1	Rises formed on fine grained Tapley Hill Formation rocks. There is up to 20% outcropping rock in linear reefs. **DSC** Undulating rises with slopes of 4-12%. **DSD** Rises and low hills up to 60 m high with slopes of 10-25%. Main soils: hard loam over red clay - **D1** (V), with shallow stony sandy loam - **L1** (C) and hard loam over poorly structured red clay on rock - **D7a** (L). Soils are generally fertile, although frequently shallow and stony, and the land is about 75% arable due to the

		moderate slopes and extent of rocky outcrop. Erosion potential is moderately high, and accentuated by the predominantly poorly structured surfaces of the main soil type.
DZC	2.9	Complex of rises formed on Appila Tillites and fans formed on alluvium. Slopes are 4-10%. There is 2-5% rocky outcrop as linear reefs and up to 20% surface quartzite. Main soils: hard sandy loam over dispersive red clay - **D7b** (E) and shallow stony sandy loam - **L1** (L) on rises, and hard loam over dispersive red clay - **D3a** (C) and stony sandy loam over dispersive clay - **F2** (L) on fans. Most soils have moderate fertility and are poorly structured. This causes excessive runoff, high erodibility and poor establishment/early growth conditions for plants.
ETD	5.2	Rocky rises, ridges and low hills, 20-30 m high with slopes of 10-25%, formed on medium to coarse grained rocks of the Appila Formation. There is 10-20% scattered rocky outcrop and up to 20% surface quartzite and sandstone. Main soils: shallow stony sandy loam - **L1** (E), with hard sandy loam over dispersive red clay - **D7b** (E). The extent of rocky outcrop and the moderate slopes limit cropping potential of this land - about 50% is arable. Soils are generally shallow and erosion potential is high. Whilst useful arable areas occur, overall this is grazing country.
JBB JBE JBH JBJ JBO JBe	1.7 0.2 3.3 2.8 1.5 2.5	Outwash fans, drainage depressions and creek flats formed on clayey alluvium. **JBB** Fans with slopes of 1-3%. **JBE** Drainage depressions with well defined water courses. **JBH** Fans with slopes of 3-6% and eroded water courses. **JBJ** Drainage depressions with eroded water courses. **JBO** Light River flats with sporadic saline seepage. **JBe** Drainage depressions with eroded water courses and up to 2% of land affected by saline seepage. Main soils: hard loam over dispersive red clay - **D3a** (E) with loam over red clay - **D2** (C), stony sandy loam over dispersive clay - **F2** (L), hard silty loam over red or brown clay - **D3b** (L) and calcareous clay loam - **A6** (M). These soils are deep and moderately fertile but are poorly structured. Waterlogging, working difficulties and emergence/early growth problems are likely. Erosion is a hazard on fans. Isolated areas in drainage depressions are affected by salinity - this should be monitored. Soil acidity is also becoming a widespread problem.

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

(D) Dominant in extent (>90% of SLU)
(V) Very extensive in extent (60–90% of SLU)
(E) Extensive in extent (30–60% of SLU)
(C) Common in extent (20–30% of SLU)
(L) Limited in extent (10–20% of SLU)
(M) Minor in extent (<10% of SLU)

Detailed soil profile descriptions:

A2 Shallow calcareous loam (Paralithic Calcarosol)
Calcareous loam grading to a highly calcareous gravelly and/or carbonate rubbly loam to clay loam over weathering rock within 50 cm.

A6 Calcareous clay loam (Hypercalcic Calcarosol)
Calcareous clay loam grading to a highly calcareous light clay over Class I carbonate.

D1 Hard loam over red clay on rock (Calcic, Red Chromosol)
10 - 40 cm hard loam to clay loam abruptly overlying a well structured red clay with soft carbonate at about 50 cm in 75% of profiles, grading to weathering siltstone, shale or phyllite at about 80 cm.

D2 Loam over red clay (Calcic, Red Chromosol)
20 - 40 cm hard loam over a well structured red clay, calcareous with depth, grading to alluvium.

D3a Hard loam over dispersive red clay (Calcic, Red Sodosol)
25 - 40 cm hard fine sandy loam to clay loam abruptly overlying a red and sometimes brown mottled clay with soft carbonate from about 80 cm, grading to alluvium.

D3b Hard silty loam over red or brown clay (Calcic, Red Sodosol)
Medium thickness hard silty loam over a red or brown, often mottled, coarsely structured clay, weakly calcareous with depth, grading to medium to fine grained alluvium.

D7a Hard loam over poorly structured red clay on rock (Calcic, Red Sodosol)
10 - 40 cm hard loam to clay loam abruptly overlying a coarsely structured dispersive red clay with soft carbonate at about 50 cm in 75% of profiles, grading to weathering shale or phyllite at about 80 cm.

D7b Hard stony sandy loam over poorly structured clay on rock (Calcic, Red / Brown Sodosol)
20 - 40 cm hard quartzite gravelly sandy loam with a bleached A2 layer, abruptly overlying a coarsely structured dispersive red or brown clay with soft carbonate from about 55 cm grading to quartzite or quartzitic sandstone or shale from about 80 cm.

F2 Stony sandy loam over dispersive clay (Brown Sodosol)
30 - 60 cm quartzite gravelly sandy loam with a bleached A2 layer overlying a brown mottled clay.

L1 Shallow stony sandy loam (Lithic, Leptic Tenosol / Rudosol)
10 - 35 cm stony sandy loam to loam directly overlying basement rock.

Further information: DEWNR Soil and Land Program